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**ADDITIONS TO VESPINE BIOLOGY—IV: NOTES ON  
INTERSPECIFIC TOLERANCE, ORPHAN NESTS,  
AND ORPHAN WASPS (HYMENOPTERA,  
VESPIDAE).**

By ALBRO T. GAUL, Brooklyn, New York.

This discussion is to record a series of observations and experiments concerning the toleration instincts and the conduct of more or less deserted nests of some of our northeastern Vespinae. The observations have been made over a period of several years in New York, New Jersey and Connecticut.

Interspecific tolerance may be defined as the forbearance of individuals of one species from attacking intruding individuals of an alien species. It has been shown that certain Vespinae have an almost complete *intraspecific* tolerance, while they are almost completely *interspecifically* intolerant (1, 2).\* An experiment was therefore planned to determine whether individuals of one species could adapt themselves to accept, in the same society, members of another species.

Since ergates kill intruding ergates or gynes of another species (except in the case of inquilines), it was thought impossible to effect a successful transplantation of imago forms into an alien colony. Consequently, it was decided to place an alien comb with brood in a nest of a closely related species.

The first opportunity for this experiment was presented on September 2, 1946, when I had nests of both *Vespula maculifrons* Buy. and *V. squamosa* Drury at my disposal. It was thought that these two colonies might present optimum possibilities for a successful brood transplantation because both species have the same nesting and feeding habits, and both belong to the same subgenus.

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\* Numbers refer to Literature Cited.

On September 2, therefore, I anaesthetized the *maculifrons* and *squamosa* colonies; removed a section of comb from the *maculifrons* colony, and placed it (with its eggs, larvae, and pupae) in the *squamosa* nest. On September 3, the *squamosa* nest was placed out of doors and was regularly observed thereafter.

For a number of days there seemed to be no deviation from normal colonial activities. Since the ergates of *maculifrons* and *squamosa* are similar in superficial color pattern and in size, they could not be determined while in flight to or from the nest. On September 15 the nest was again anaesthetized to determine whether this transplantation of brood had succeeded.

The comb of *maculifrons* had been incorporated into the *squamosa* nest. It had been attached to the original nest by new suspensors and was further fastened to the envelope, much as normal repair on a loosened comb. There were 18 ergates of *maculifrons* among the *squamosa* ergates. Some of the *maculifrons* comb contained new eggs, probably deposited by the *squamosa* gyne. The nest was returned out of doors and was not again disturbed until it was found deserted on October 16, 1946. During this time the *maculifrons* brood had all matured and the walls of the comb cells had been stripped, leaving the basement of the comb. There were a few *maculifrons* males left in the nest.

This experiment may be interpreted in terms of the normal instincts of Vespine ergates. Except when social degeneration results in cannibalism, there is no instinct to harm brood. Since there may never before have been brood of an alien species in a Vespine nest (except inquilines) there would be no instinct to harm this transplanted brood. Following their normal instincts, the *squamosa* ergates fed some of the alien brood and reared them to maturity. During this period they learned to accept the brood as their own. The *maculifrons* in turn, knew no other home and accepted the *squamosa* nest as their own. On October 6, I observed a lone *maculifrons* ergate effecting minor nest repairs; showing the *maculifrons*' acceptance of their home.

What factors caused the partial destruction of the *maculifrons* brood comb after it was used is a matter for conjecture. It has been shown, however, that species which are mutually intolerant of intruders can become tolerant toward the brood and reared imagines of the alien species.

#### ORPHAN NESTS.

Phil Rau defines orphan nests as nests from which all the adult forms have been removed, but which still contain immature brood. His experiments with orphan nests of various species of *Polistes* (3)

show that the first workers to emerge from a nest without adults are the workers which assume some of the duties of the queen, and manage colony affairs.

This also seems true among some Vespinae. On September 2, 1946, I removed a large piece of brood comb from the nest of *V. maculifrons* previously mentioned in this paper. I removed all the adults and placed the brood in a convenient cardboard box. The box had a "nest entrance" hole cut in one end. It was placed out of doors about seven feet from the ground. This position was not in keeping with the normal nesting habits of the species (which is a subterranean builder).

On September 5, 1946, two adult workers had emerged and walked about on the nest. As many individual wasps have clypeal markings of somewhat different configuration, I was able to identify these two wasps as individuals. These ergates could not have wandered into the nest from the original colony, as the original colony had been removed nearly one quarter of a mile on September 2.

By September 6, the two ergates were making regular, alternate, foraging trips. One always remained on the nest. By September 10, there were ten ergates on the comb. At this time, one of the original two ergates had encountered some catastrophe; the other remained on the nest and did not leave it at all. Some of the later arrivals also met their death, because on September 12 there were only seven ergates left. One of these was the same survivor of the first pair to emerge.

This is the only instance which has come to my attention where there has been an orphan nest of a Vespine. I have never seen such a condition in the field. It would seem though, that the behavior pattern of the first emerging wasp is similar to the pattern outlined for *Polistes*.

#### ORPHAN WASPS.

From time to time, when it has been necessary for me to capture colonies of Vespines during the daytime, because of the increased personal hazard presented by flying ergates, it has been expedient to remove the nest from its site and to leave hurriedly. This situation brings to light a new category which can perhaps be best described as "orphan wasps" or wasps whose homes have been removed during their absence in the field. By paying return visits to such nest sites, it has been possible to observe two general types of response on the part of these orphans, to the removal of their home.

The first, and commonest response: the few remaining wasps fly about the former nest site for several days and then either die or desert. This is the usual situation when a comparatively few ergates remain behind. This response has been noted among *Dolichovespula arenaria* F., *D. maculata* L., and *V. maculifrons* Buy. although it is probably a common occurrence among most Vespinae.

The second response, which occurs only when a comparatively large number of ergates are left at the original nest site, involves the construction of a new nest. Frequently, if enough workers are present and the season not too far advanced, they may even build a new comb in the nest. I do not know whether they rear brood in this comb. I have made observations of this type on colonial sites of *D. arenaria* and *V. squamosa*, and I suspect that the same thing will be observed among other species.

In the instance of the *V. squamosa* nest, the site was revisited one week after the capture of the nest. Since the nest was subterranean, the ground was smoothed over and more or less tamped into place after the excavation of the nest. It was rather surprising therefore to see an entirely new, albeit smaller *squamosa* nest in exactly the same place. The new nest was about one and one half inches in diameter, while the nest cavity was somewhat larger and contained about 15 ergates.

To a limited extent this observation conflicts with opinions on the selection of nest sites by the foundress queens, who are reported by Duncan (4) as selecting any available spot having some supporting matter from which to suspend a nest. Here is an instance in which the workers built a nest *where there was no available spot*. Perhaps the workers have no instinct to select a nest site, and therefore had to rebuild on the spot they knew; or (perhaps less likely) the ground in the former nest site was permeated with a nest odor (that boon to all unanswered questions) which continued to attract the workers to that spot alone.

A similar instance appears in my field notes of July 1939 at Lakeville, Conn. when orphan ergates of *D. arenaria* undertook nest reconstruction on the identical currant bush from which the parent nest had been removed.

In conclusion, by experimental methods, brood of one species of Vespine may be reared by another species of Vespine usually inimical to the adults. Brood comb having no adults will be likely to be superintended by the first ergates to emerge from that comb. Workers who are orphaned by the removal of their nest may desert

the area or they may rebuild, depending on the number of workers left behind.

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